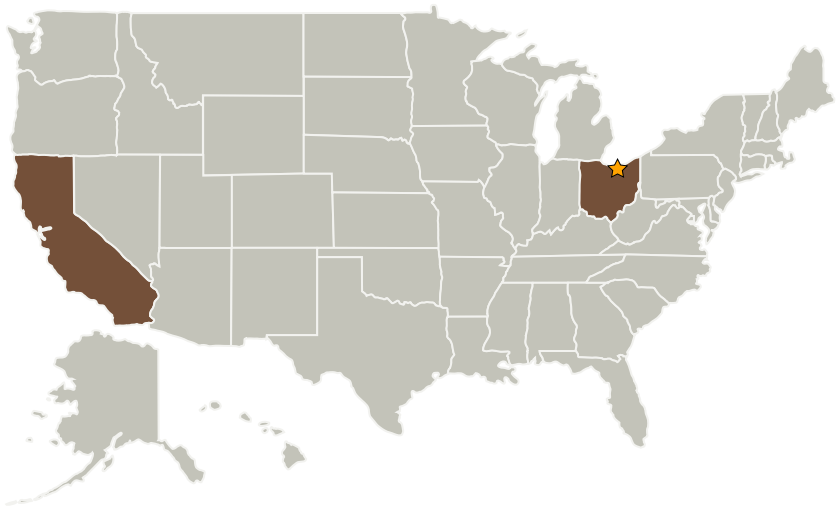
# Durable, High Thermal Conductivity Melt Infiltrated Ceramic Composites for Turbine Engine Applications, Phase I

Completed Technology Project (2008 - 2008)

## Project Introduction

Durable, creep-resistant ceramic composites are necessary to meet the increased operating temperatures targeted for advanced turbine engines. Higher operating temperatures result in improved performance, fuel savings (higher efficiency) and reduced pollution. Silicon melt infiltrated ceramic composites have been identified as having a 2400F maximum use temperature, which does not take advantage of the highest temperature capability of the newest generation of near stoichiometric SiC fibers. Conversely ceramic composites containing a SiC matrix derived from chemical vapor infiltration have sufficient stability to take full advantage of the creep resistance of the fibers. For many applications, no existing matrix system for SiC-reinforced composites has sufficient through-thickness thermal conductivity at elevated temperatures to result in low thermally induced stresses; such that longer service life at higher temperatures can be achieved. This Phase I work will demonstrate a higher temperature melt infiltrated matrix that is stable to 2950F, and thus allows the full temperature capability of the latest generation SiC fiber reinforcements to be used. This higher temperature capability is combined with a significantly higher predicted elevated temperature thermal conductivity for the ceramic composite, which will reduce the thermally induced stresses on the material that often dominate the stress state on the material. The Phase I effort will produce ceramic composites with this higher temperature melt infiltrated matrix and perform both thermal and mechanical property evaluations at ambient and elevated temperatures to demonstrate the benefits of the system.

## Primary U.S. Work Locations and Key Partners

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## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Glenn Research Center (GRC)

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

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| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| ★Glenn Research Center(GRC) | Lead Organization | NASA Center | Cleveland, Ohio |
| Hyper-Therm High-Temperature Composites | Supporting Organization | Industry | Huntington Beach, California |

| Primary U.S. Work Locations | |
|---|---|
| California | Ohio |

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

Robert Shinavski

## Technology Areas

**Primary:**

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.1 Materials
    - TX12.1.6 Materials for Electrical Power Generation, Energy Storage, Power Distribution and Electrical Machines